

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Rainfall is expressed in inches.

Alabama.—The mean temperature was 81.3°, or 2.2° above normal; the highest was 103°, at Riverton on the 12th, and the lowest, 58°, at Opelika on the 30th. The average precipitation was 3.68, or 1.14 below normal; the greatest monthly amount, 8.55, occurred at Newton, and the least, 0.70, at Florence.—*F. P. Chaffee.*

Arizona.—The mean temperature was 80.7°, or 2.2° below normal; the highest was 118°, at Fort Mohave on the 31st, and the lowest, 34°, at Flagstaff on the 23d. The average precipitation was 1.26, or 0.85 below normal; the greatest monthly amount, 5.77, occurred at Fort Huachuca, while none fell at several stations.—*W. G. Burns.*

Arkansas.—The mean temperature was 82.2°, or 3.6° above normal; the highest was 112°, at Conway on the 12th and 23d, and the lowest, 54°, at Rison on the 12th. The average precipitation was 2.04, or 1.13 below normal; the greatest monthly amount, 6.45, occurred at Lacrosse, and the least, 0.07, at Spiroville.—*E. B. Richards.*

California.—The mean temperature for the State, obtained by weighting the reports from 287 stations, so that equal areas have about the same weight, was 70.8°, or 5.1° below the August normal for the State, as determined from 200 records; the highest was 120°, at Volcano Springs on the 31st, and the lowest, 20°, at Bodie on the 22d and 23d. The average precipitation for the State, as determined by the records of 302 stations, was 0.11; the excess, as indicated by reports from 209 stations which have normals, was 0.05; the greatest monthly amount, 1.75, occurred at Fordyce Dam, while none fell at many stations.—*Alexander G. McArdie.*

Colorado.—The mean temperature was 66.3°, or 0.5° below normal; the highest was 106°, at Lamar on the 26th and 27th, and the lowest, 20°, at Troutvale on the 20th. The average precipitation was 1.56, or about normal; the greatest monthly amount, 3.98, occurred at Smoky Hill Mine, and the least, 0.18, at Ruby.—*F. H. Brandenburg.*

Florida.—The mean temperature was 82.2°, or 1.2° above normal; the highest was 102°, at De Funiak Springs on the 6th, and the lowest, 62°, at Fort Meade on the 1st, 6th, 8th, and 10th. The average precipitation was 6.62, or about normal; the greatest monthly amount, 11.80, occurred at De Funiak Springs, and the least, 2.02, at Tarpon Springs.—*A. J. Mitchell.*

Georgia.—The mean temperature was 81.1°, or 2.2 above normal; the highest was 105°, at Fleming on the 6th and 7th and at Covington on the 21st and 22d; the lowest was 57°, at Millen on the 18th. The average precipitation was 4.53, or 1.02 below normal; the greatest monthly amount, 12.00, occurred at Crescent, and the least, 1.17, at Eastman.—*J. B. Marbury.*

Idaho.—The mean temperature was 61.1°, or 6.3° below normal; the highest was 111°, at Hagerman on the 2d, and the lowest, 19°, at Chesterfield and Downey on the 22d. The average precipitation was 1.17, or 0.68 above normal; the greatest monthly amount, 3.61, occurred at Murray, and the least, trace, at Blackfoot and Oakley.—*S. M. Blandford.*

Illinois.—The mean temperature was 76.3°, or 2.6 above normal; the highest was 102°, at Bloomington on the 27th, and the lowest, 41°, at Lanark and Savanna on the 16th. The average precipitation was 2.57, or 0.19 below normal; the greatest monthly amount, 7.49, occurred at Hillsboro, and the least, 0.57, at Danville.—*C. E. Linney.*

Indiana.—The mean temperature was 76.1°, or 3.7 above normal; the highest was 102°, at Princeton on the 2d, and the lowest, 49°, at Laporte on the 16th. The average precipitation was 3.03, or about normal, but badly distributed, an excess occurring in the southern portion and a deficiency in the northern; the greatest monthly amount, 7.68, occurred at Paoli, and the least, trace, at Valparaiso.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 74.4°, or 3.3 above normal; the highest was 100°, at Wapello on the 3d, at Bedford on the 9th, and at Clarinda and Hampton on the 23d; the lowest was 41°, at Hampton on the 25th. The average precipitation was 3.68, or 0.61 above normal; the greatest monthly amount, 10.45, occurred at Thurman, and the least, 1.12, at Algona.—*J. R. Sage, Director; G. M. Chappel, Assistant.*

Kansas.—The mean temperature was 80.6°, or 4.2° above normal, and the warmest August on record; the highest was 109°, at Englewood on the 11th, and at Medicine Lodge on the 19th, and the lowest, 42°, at Achilles on the 14th. The average precipitation was 2.09, or 0.79 below normal; the greatest monthly amount, 6.39, occurred at Sedan, and the least, 0.19, at Colby.—*T. B. Jennings.*

Kentucky.—The mean temperature was 78.1°, or 2.4° above normal; the highest was 102°, at Maysville on the 3d and at Paducah on the 11th, and the lowest, 51°, at Catlettsburg on the 1st and at Greensburg on the 8th. The average precipitation was 3.09, or 0.31 below normal, and very unevenly distributed; the greatest monthly amount, 5.83, occurred at Maysville, and the least, 1.26, at Greensburg.—*H. B. Hersey.*

Louisiana.—The mean temperature was 83.3°, or 2.3° above normal; the highest was 108°, at Liberty Hill on the 1st, and the lowest, 60°, at Plaquemine on the 5th and at Cheneyville on the 17th. The average precipitation was 4.55, or 0.83 below normal; the greatest monthly amount, 10.61, occurred at White Sulphur Springs, and the least, 0.61, at Shreveport.—*W. T. Blythe.*

Maryland and Delaware.—The mean temperature was 74.3°, or normal; the highest was 102°, at Sandy Point, Md., on the 5th, and the lowest, 41°, at Grantsville, Md., on the 17th and at Deerpark, Md., on the 23d. The average precipitation was 4.36, or 0.47 above normal; the greatest monthly amount, 7.66, occurred at Millsboro, Del., and the least, 0.75, at Boettcherville, Md.—*F. J. Wale.*

Michigan.—The mean temperature was 69.1°, or 2.7° above normal; the highest was 100°, at Owosso on the 19th and 20th, and the lowest, 30°, at Humboldt on the 7th, at Wetmore on the 13th, at Luzerne on the 15th, and at Newberry and Mancelona on the 23d. The average precipitation was 1.25, or 1.55 below normal; the greatest monthly amount, 5.88, occurred at Humboldt; no precipitation occurred at Allegan and only a trace at Port Austin, Hayes, Carsonville, and Ovid.—*C. F. Schneider.*

Minnesota.—The mean temperature was 69.1°, or about 2.0 above normal; the highest was 102°, at New Ulm on the 10th, and the lowest, 33°, at Hallock on the 13th. The average precipitation was 5.35, or 2.50 above normal; the greatest monthly amount, 11.68, occurred at Morris, and the least, 2.42, at New Folsen.—*T. S. Outram.*

Mississippi.—The mean temperature was 82.4°, or 2.3 above normal; the highest was 107°, at Westpoint on the 12th and 23d, and the lowest, 60°, at Hernando on the 27th. The average precipitation was 3.70, or 0.99 below normal; the greatest monthly amount, 8.66, occurred at Windham, and the least, 0.80, at Hazelhurst.—*H. E. Wilkinson.*

Missouri.—The mean temperature was 78.7°, or 3.7° above normal; the highest was 107°, at Appleton City on the 23d, and the lowest, 49°, at Potosi on the 22d. The average precipitation was 3.34, or 0.13 above normal; over portions of the central and northern sections there was a decided excess, while over a large area in the southwestern portion of the State there was a marked deficiency; the greatest monthly amount, 7.33, occurred at Hannibal, and the least, 0.20, at Mineral springs.—*A. E. Hackett.*

Montana.—The mean temperature was 60.0°, or 4.5° below normal; the highest was 98°, at Glendive on the 13th, and at Fort Keogh on the 14th and 21st, and the lowest, 26°, at Ovando on the 29th. The average precipitation was 1.22, or 0.48 above normal; the greatest monthly amount, 3.44, occurred at Columbia Falls, and the least, trace, at Billings.—*E. J. Glass.*

Nebraska.—The mean temperature was 73.8°, or about 1.0° above normal; the highest was 108°, at Camp Clarke on the 28th, and the lowest, 31°, at Kennedy on the 31st. The average precipitation was 3.26, or 0.67 above normal; the greatest monthly amount, 9.78, occurred at Fremont, and the least, 0.10, at Merriman.—*G. A. Loveland.*

Nevada.—The mean temperature was 63.6°, or about 6.4° below normal; the highest was 99°, at Empire Ranch on the 2d, and the lowest, 20°, at Wells on the 20th. The average precipitation was 0.71, or about 0.02 above normal; the greatest monthly amount, 3.10, occurred at Elko, while none fell at Los Vegas and Mill City.—*J. H. Smith.*

New England.—The mean temperature was 67.4°, or 0.3 above normal; the highest was 99°, at Statford, Vt., on the 30th, and the lowest, 32°, at Flagstaff, Me., on the 15th. The average precipitation was 1.94, or 2.26 below normal; the greatest monthly amount, 6.50, occurred at Kingston, R. I., and the least, trace, at Orono, Me.—*J. W. Smith.*

New Jersey.—The mean temperature was 72.3°, or about normal; the highest was 99°, at Salem on the 5th and at Dover on the 21st, and the lowest, 39°, at Charlotteburg on the 9th. The average precipitation was 4.36, or 0.52 above normal; the greatest monthly amount, 9.70, occurred at Tuckerton, and the least, 2.21, at Freehold.—*H. W. McGann.*

New Mexico.—The mean temperature was 72.8°, or 1.4° above normal; the highest was 109°, at Eddy on the 12th, and the lowest, 28°, at Winsors on the 20th. The average precipitation was 0.89, or 1.53 below normal; the greatest monthly amount, 3.30, occurred at Aztec, while at Clayton there was none recorded, and at Eddy only a trace.—*R. M. Hardinge.*

New York.—The mean temperature was 69.3°, or 2.1° above normal; the highest was 100°, at Nunda on the 20th, and the lowest, 33°, at Straits Corners on the 15th and 16th and at Saranac Lake on the 16th. The average precipitation was 1.88, or 2.10 below normal; the greatest

monthly amount, 5.28, occurred at Plattsburg Barracks, and the least, 0.05, at Mount Morris.—*R. G. Allen.*

North Carolina.—The mean temperature was 77.7°, or 1.7° above normal; the highest was 102°, at Southern Pines on the 3d and at Saxon on the 20th, and the lowest, 47°, at Linnville on the 16th. The average precipitation was 4.18, or 1.60 below normal; the greatest monthly amount, 14.19, occurred at Hatteras, and the least, 0.65, at Soapstone Mount.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 65.5°, or 0.6° below normal; the highest was 97°, at Medora on the 25th, and the lowest, 32°, at Foxholm and Hamilton on the 13th, Woodbridge on the 29th, and Minto on the 31st. The average precipitation was 2.90, or 1.32 above normal; the greatest monthly amount, 7.80, occurred at Fullerton, and the least, 0.24, at Melville.—*B. H. Bronson.*

Ohio.—The mean temperature was 73.7°, or 2.5 above normal; the highest was 104°, at Warsaw on the 20th, and the lowest, 39°, at Wooster on the 7th. The average precipitation was 1.82, or 1.26 below normal; the greatest monthly amount, 6.26, occurred at New Paris, and the least, 0.15, at Plattsburg.—*J. Warren Smith.*

Oklahoma.—The mean temperature was 85.6°, or 6.2 above normal; the highest was 113°, at Kemp on the 26th, and the lowest, 59°, at Pawhuska and Prudence on the 29th. The average precipitation was 0.87, or 2.29 below normal; the greatest monthly amount, 3.18, occurred at Perry, while none fell at many stations in the south and west.—*J. I. Widmeyer.*

Oregon.—The mean temperature, 60.6°, the lowest on record, was 5.0° below normal; the highest was 97° at Pendleton on the 4th, and the lowest, 16°, at Riverside on the 14th. The average precipitation, 2.42, was 1.84 in excess of the normal, and was the heaviest on record; the greatest monthly amount, 8.13, occurred at Nehalem, and the least, 0.08, at Klamath Falls.—*B. S. Pagus.*

Pennsylvania.—The mean temperature was 71.2°, or 1.6° above normal; the highest was 101°, at Huntingdon on the 21st, and the lowest, 33°, at Shingle House on the 9th. The average precipitation was 4.01, or 0.33 above normal; the greatest monthly amount, 10.09, occurred at Carlisle, and the least, 0.07, at Erie.—*T. F. Townsend.*

South Carolina.—The mean temperature was 81.2°, or 2.6° above normal; the highest was 103°, at Batesburg and Beaufort on the 6th, and the lowest, 59°, at Santuc on the 18th. The average precipitation was 6.26, or about normal; the greatest monthly amount, 17.94, occurred at Pinopolis, and the least, 1.33, at Cheraw.—*J. W. Bauer.*

South Dakota.—The mean temperature was 71.4°, or about 1.0° above normal; the highest was 104°, at Interior on the 16th, and the lowest, 30°, at Rochford on the 24th. The average precipitation was 3.55, or about 1.06 above normal; the greatest monthly amount, 9.56, occurred at White Swan, and the least, trace, at Farmingdale.—*S. W. Glenn.*

Tennessee.—The mean temperature was 79.2°, or 3.6° above normal; the highest was 103°, at Covington on the 13th, and the lowest, 51°, at Erasmus on the 19th and at Silverlake on the 24th and 25th. The

average precipitation was 2.47, or 1.03 below normal; the greatest monthly amount, 5.68, occurred at Tracy City, and the least, 0.31, at Union City.—*H. C. Bate.*

Texas.—The mean temperature, determined by comparison of 46 stations distributed throughout the State, was 3.1° above the normal; there was a general excess in temperature for the month, ranging from 1.0° to 7.0°, with the greatest over the northwest portion of the State; the highest was 112°, at Mann on the 23d, and the lowest, 56°, at Marathon on the 30th. The average precipitation, determined by comparison of 53 stations distributed throughout the State, was 1.97 below the normal; there was a slight excess in the vicinity of Beaumont and Houston, while there was a general deficiency elsewhere, ranging from 1.00 to 3.33, with the greatest deficit over southwest Texas. The rainfall for August was light and very unevenly distributed over the State. The greatest monthly amount, 5.95, occurred at Jasper, while none fell at many stations over the western half of the State.—*I. M. Oline.*

Utah.—The mean temperature was 65.7°, or 5.2° below normal; the highest was 102°, at St. George on the 31st, and the lowest, 24°, at Croydon on the 23d. The average precipitation was 0.96, or 0.27 above normal; the greatest monthly amount, 2.93, occurred at St. George, while none fell at Terrace. It was the coolest August in Utah of which there is any record.—*L. H. Murdoch.*

Virginia.—The mean temperature was 75.5°, or about 0.5° above normal; the highest was 102°, at Farmville on the 5th, and the lowest, 42°, at Burkes Garden on the 24th. The average precipitation was 4.62, or 0.25 above normal; the greatest monthly amount, 8.81, occurred at Fontella, and the least, 1.39, at Burkes Garden.—*E. A. Evans.*

Washington.—The mean temperature was 60.8°, or about 5.0° below normal; the highest was 100°, at Lind on the 3d, and the lowest, 30°, at Cle-Elum on the 28th. The average precipitation was 2.24, or about three to four times the normal; the greatest monthly amount, 5.77, occurred at Snohomish, and the least, 0.23, at Connell. The month was phenomenally cool and wet, breaking all records of August for low temperature and excessive precipitation.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 73.5°, or 1.2° above normal; the highest was 100°, at New Cumberland on the 20th, and the lowest, 34°, at Terra Alta on the 7th. The average precipitation was 2.64, or 0.92 below normal; the greatest monthly amount, 6.37, occurred at Madison, and the least, 0.34, at Romney.—*C. M. Strong.*

Wisconsin.—The mean temperature was 70.5°, or 2.6 above normal; the highest was 98°, at Brodhead on the 27th, and the lowest, 37°, at Butternut on the 6th. The average precipitation was 3.27, or 0.69 above normal; the greatest monthly amount, 7.40, occurred at Prentice, and the least, 0.36, at Green Bay.—*W. M. Wilson.*

Wyoming.—The mean temperature was 63.0°, or 2.7° below normal; the highest was 101°, at Lovell on the 1st, and the lowest, 20°, at Burns on the 22d and 23d. The average precipitation was 0.82, or 0.06 below normal; the greatest monthly amount, 2.23, occurred at Fort Yellowstone, and the least, trace, at Buffalo.—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

WATERSPOUTS AT KEY WEST, FLA.¹

By H. R. BOYNTON, Observer, Weather Bureau (dated May 26, 1899.)

Seven waterspouts were observed simultaneously, by myself, on the morning of May 26, 1899, at Key West, Fla. They were at an estimated distance of two miles and moving from north to south. Four were well defined and three others plainly outlined. The four fully formed one would sometimes disappear, when others would form and take their places. The procession of whirlwinds moved slowly, thus furnishing an unusually good opportunity for observing the

¹ Waterspouts are so common at stations on the Gulf coast that we can but hope that they may be utilized as a test of the modern thermodynamic theories of the condensation of vapor and formation of clouds. This theory was first put into definite shape by Ferrel in his *Recent Advances*, but improvement has been made in several points since then by Professor Brillouin of Paris and Prof. F. H. Bigelow of the Weather Bureau. In order to properly study the waterspout we need a series of photographs on a large scale, taken simultaneously from opposite points of view, with the modern photogrammeter, which is simply a camera so mounted as to be movable in altitude and azimuth, with means for accurately determining the direction in which it is pointed at any time. Until such a determined effort has been made to achieve a scientific study of the waterspout (and a similar one of the tornado) we must be content with the general descriptions recorded by careful observers, such as the accompanying from Mr. H. R. Boynton, which is certainly an interesting addition to our knowledge of the waterspout.—*Ed.*

gradual formation of each waterspout. A partially-formed spout would extend downward from the moisture-laden cloud, swing a short distance through space, then be drawn up into the cloud and disappear. This occurred several times; meantime others would reach down from the cloud and descend far enough to form a fully-developed spout connecting with the water below which was already in commotion caused by the influence of the whirling wind. At times the water would rise from below, seemingly outside of the main spout and half way up its trunk. At one time the cross section appeared to form a parallelogram across the main trunk, one-third of the distance from the top, and took the shape of a perfect dagger. The cross-piece had, seemingly, square corners (but a circular ring, observed from a distance, would appear like a parallelogram). This spout, which took the form of a cross, was at first a short spur not more than 3° long, and grew slowly out of the cloud at an angle of 45°. At times it had an undulatory motion. People on vessels in the vicinity say that the water forming up around the base of each column showed forth very brightly the colors of the rainbow. I observed that the sea in the vicinity showed the same characteristics but not so vividly. The cloud above the waterspout was very dark and the sea beneath looked as black as ink. At intervals throughout the forenoon there were whirlwinds in the streets here, of which I saw three at one time.